

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in or relating to Electrical Fuses

We, KENNETH EARDLEY BESWICK, and DAVID GRANT EARDLEY BESWICK, both British Subjects, and both of "Wiltoughbys," Easterton, near Devizes, Wiltshire, do hereby declare the nature of this invention to be as follows:—

The invention relates to electrical fuses of the cartridge type and has for its object the provision of a cartridge fuse of improved construction.

According to the present invention a cartridge fuse comprises a rigid tube of insulating material, a fusible element extending axially within the tube and held substantially central by conducting inner end caps or washers at each end of the tube, the ends of said fusible element being turned back so as to lie along the outside of the tube, there being over each of said inner end caps or washers and in electrical contact therewith an outer cap of electrically conducting material which is a forced fit over the end of the tube. The inner cap, the outer cap or the tube being formed with a slit or groove to accommodate the turned over end of the fusible element between the outer cap and the tube without substantial distortion of the outer cap, the fuse being assembled without the use of soldering.

In one embodiment of the invention, described below, by way of example, the fuse consists of a ceramic tube over the ends of which are placed the inner caps which are of copper and protected from corrosion by tinning. Each inner cap is in the form of a short tube closed at one end except for a small hole through which the fusible element passes. The wall of the tube, which forms the skirt of the cap, is slit on one side throughout its length. The fusible element consists of a length of fuse wire, which may be, for example, tinned copper; this is threaded through the end caps and the tube and its free ends bent over so as to lie in the slits

cut in the skirt of the end caps. The internal diameter of the skirt of each cap is such that the cap is a close fit on the end of the tube.

An outer cap of metal also formed with a skirt is applied over each of the inner caps, the skirt of the outer cap being somewhat longer than that of the inner cap. The outer cap is constructed so that a good pressure is required to press it into position over the inner cap, it is thus held tightly in position and cannot be removed without the use of a machine. In order to improve the grip of the outer cap on the end of the tube it may be subjected to a swaging operation by means of which a circumferential groove (or grooves) is formed on the outer cap.

The presence of the slit in the skirt of the inner cap enables the fusible element, which is gripped between the ends of the inner and outer caps, to lie between the tube and the outer cap without distorting the latter. Where a very fine fuse wire is used it may be found desirable to draw the end of the wire from the slit under the skirt of the inner cap. With very fine wires this improves the grip on the fusible element while introducing a negligible degree of distortion to the outer cap. Whether or not this procedure is desirable in any particular case will depend on the relative dimensions of the part of the fuse and the degree of distortion acceptable in the outer cap.

The inner cap may be constructed without a skirt, that is to say it may be in the form of a plain washer, in which case it is necessary to provide a groove either in the ceramic tube or in the inner surface of the skirt of the outer cap or in both. Where the inner cap is formed with a skirt the end of the fusible element may be accommodated by means of a groove formed in the inner surface of the outer cap, thus dispensing with the slit in

the inner cap or in co-operating grooves in the ceramic tube and the inner cap. Whether or not any of these methods of construction are possible or desirable will depend on the relative sizes of the parts of the fuse.

The construction described above has been found to provide a satisfactory fuse for the protection of relatively light electrical equipment and has the advantage that a fuse can be made without the use

of soldering.

The materials used in the construction of the fuse need not be as described above but may be varied according to known practice in the art.

Dated this 5th day of September, 1949.

For the Applicants,
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COMPLETE SPECIFICATION

Improvements in or relating to Electrical Fuses

We, KENNETH EARDLEY BESWICK, and DAVID GRANT EARDLEY BESWICK, both British Subjects, and both of "Wiltoughbys," Easterton, near Devizes, Wiltshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to electrical fuses of the cartridge type and has for its object the provision of a cartridge fuse of improved construction.

We are aware that it has previously been proposed to provide cartridge fuses in which the fusible element is gripped at its ends between inner and outer metal caps fitted to the end of a tube of insulating material.

According to the invention a cartridge fuse comprising a fusible wire located centrally in a rigid tube of insulating material by inner end members of electrically conducting material engaging the ends of the tube, the wire passing outwardly through central holes in said inner end members and being bent back so as to lie alongside the outside of the tube between the latter and the skirts of tightly fitting closure caps of electrically conducting material, is characterized in that a circumferential groove is formed, by a swaging operation, in the skirt of each closure cap after the parts have been assembled, to ensure positive electrical contact and to improve the grip of said cap on the end of the tube.

The inner end members may be caps the skirts of which are slit to provide channels which receive the bent-back ends of the fusible element or may be flat metal washers, channels being provided by grooving the tube or the skirts of the closure caps.

The invention is hereinafter described with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of a cartridge fuse according to the present invention;

Figure 2 is a perspective view of a cartridge fuse according to the invention with one closure cap partly broken away, and the other closure cap in its initial form prior to assembly; and

Figure 3 is a perspective view similar to Figure 2, but showing a different form of locating member.

Referring to the drawings, Figure 1 shows a complete fuse according to the invention, the fuse including a ceramic tube 10 and metal end caps 11 and 12 which fit tightly on the ends of the tube 10 thus completely closing its interior. Grooves 13 are formed in the end caps 11 and 12 after these have been placed in position, the grooves being formed by a swaging operation serving to ensure positive electrical contact and to improve the tight fit of the end caps on the tube 10. The fusible element is indicated in dotted lines at 14 and extends centrally through the tube.

Referring to Figure 2 in which a fuse is shown with the outer cap 12 partly broken away and the cap 11 not yet attached to the tube, it will be seen that the fusible element 14 passes through a central hole 15 in a locating member 16 at each end of the tube, each locating member 16 being constituted by an inner cap. The skirt of each locating member 16 is slit at 17 and as shown at the right hand end of the Figure the fusible element is bent over after passing through the hole in the locating member and lies in the slit 17. As the fusible element lies in the slit in the locating member 16 it does not cause a bulge in the skirt of the outer caps 11 and 12 and thus avoids distortion of the contact surfaces of the outer caps 11 and 12. The wire is gripped between the end surfaces of the locating members and the caps 11, 12, the fuse, after

assembly, being subjected to end pressure both to ensure a firm grip on the wire between these end surfaces, and to ensure that the fuse has the correct total length.

6 Consequently, it is not necessary that the wire shall have a diameter greater than the thickness of the locating member.

Figure 3 shows an alternative arrangement in which the locating members are plain flat washers 18 notched at one point on their periphery at 19. The ceramic tube 10 in this case is provided with a longitudinal groove 20 extending for a short distance from each end and each end of the fusible element 14 is bent over after passing through a central hole 21 in one of the washers 18 and lies in one notch 19 and groove 20 so that, as in the previous case, it does not produce a bulge in the outer cap 11 and 12.

Where a fusible element is constituted by a very fine fuse wire and the arrangement shown in Figure 2 is employed, it may be found desirable to draw the end of the wire from the slit under the skirt of the locating member. With very fine wires this improves the grip on the fusible element while introducing a negligible degree of distortion in the outer cap. Whether or not this procedure is desirable in any particular case will depend on the relative dimensions of the part of the fuse and the degree of distortion acceptable in the outer cap.

35 Where the locating member is a plain washer the groove to receive the end of the fusible element may be formed in the outer cap instead of being formed in the ceramic tube. Where the locating member is constituted by an inner cap having a skirt, the skirt may be uninterrupted and the end of the wire accommodated in an internal groove in the outer cap. The selection of one or other of these various methods of construction for any particular case will depend on the relative sizes of the parts of the fuse.

The fusible element may comprise a length of tinned copper wire and the caps or the caps and washers may be of copper and may be protected from corrosion by tinning.

56 The construction described above has been found to provide a satisfactory fuse for the protection of relatively light electrical equipment and has the advantage that a fuse can be made without the use of soldering.

The materials used in the construction of the fuse need not be as described above but may be varied according to known practice in the art.

It will be appreciated that the end caps are held in position solely by the fact that they are a tight fit on the tube and no soldering is used in the construction of the fuse.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A cartridge fuse comprising a fusible wire located centrally in a rigid tube of insulating material by inner end members of electrically conducting material engaging the ends of the tube, the wire passing outwardly through central holes in said inner end members and being bent back so as to lie alongside the outside of the tube between the latter and the skirts of tightly fitting closure caps of electrically conducting material, characterized in that a circumferential groove is formed, by a swaging operation, in the skirt of each closure cap after the parts have been assembled, to ensure positive electrical contact and to improve the grip of said cap on the end of the tube.

2. A cartridge fuse according to claim 1, wherein the inner end members are caps the skirts of which are slit to provide channels which receive the bent-back ends of the fusible element.

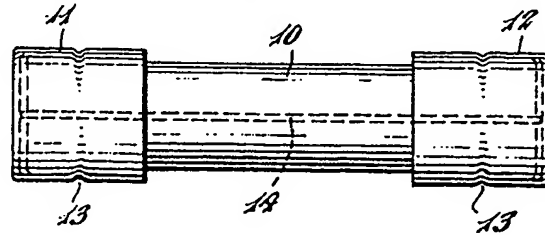
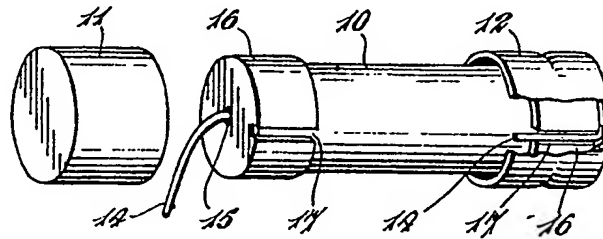
3. A cartridge fuse according to claim 1, wherein the inner end members are flat metal washers, and channels are provided to receive the bent-back ends of the fusible element by grooving the tube or the skirts of the closure caps.

4. A cartridge fuse substantially as described with reference to, and as shown in, Figures 1 and 2 of the accompanying drawings.

5. A cartridge fuse substantially as described with reference to, and as shown in, Figure 3 of the accompanying drawings.

Dated this 16th day of November, 1949.

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Fig. 1.*Fig. 2.**Fig. 3.*